THE LOWLY SIDEWALK

it receives less attention and effort than anything produced by the concrete construction industry, yet its performance affects everyone with whom our industry does business

TO THE MAN-IN-THE-STREET, the sidewalk is an everyday example of concrete work. Few products offer the concrete contractor a better opportunity to show what can be done with cement and aggregates. But, ironically enough, of all the things made of concrete, sidewalks too often seem to exemplify the poorest workmanship and the greatest neglect.

All across the country sidewalks are in need of repair. In Chicago, for example, city engineers admit that at least 1,000 miles of sidewalks should be fixed or replaced. The city earmarks no regular funds for adequate sidewalk maintenance. Until money is available, a bad situation gets worse instead of better.

The picture is equally clouded in the suburbs. Like the big cities, suburban communities are short of funds. Streets, sewers, parks, and sanitation almost invariably have a priority over sidewalks. Walks are often allowed to disintegrate so competely as to become a threat to life and limb, as well as an eloquent condemnation of the careless builder.

Many suburban homeowners are underwriting their own sidewalk repairs. Grudgingly they either call in a contractor or attempt to do the job themselves. They are motivated by pride and by a do-it-yourself eagerness to get the job done. A broken sidewalk detracts from a neatly kept home.

Unfortunately the do-it-yourselfer is partly responsible for the sad state of sidewalks in many communities. He almost unfailingly lacks the knowledge, the skill, and the tools to place concrete properly.

The shoestring contractor is another culprit. Likewise short of know-how and experience, he accomplishes little more than the man who does it himself. He has neither pride in his work nor an identification with the industry. But unfortunately the onus of poor work, no matter who does it, is finally carried by concrete itself, notwithstanding the fact that concrete is the ideal

FILE: Slabs

material for sidewalk construction.

To build a durable sidewalk, a contractor should apply the same principles that relate to other forms of flatwork. He must approach a sidewalk job with the same care and preparation that he puts into drives, aprons, runways, and floors. There are no shortcuts. Even a small repair job demands time and attention.

The basic requirements for a satisfactory job are good materials and good construction methods. You must start with enough cement, a clean aggregate, and potable water, relatively free of deleterious foreign matter. Air entrainment is essential.

As in other kinds of work, air entrainment pays off in strength and durability. Air entrainment is a primary deterrent to spalling, crazing, and scaling, and it should be regarded as a must in all exposed slabs.

By ordering his concrete from a ready mixed concrete producer, the contractor eliminates all the detail that goes into proportioning cement, aggregates, water and air entraining agents. At the same time he is assured of a mix that is suitable for the job and for local conditions. All that's required is to order a mix that meets the specifications for sidewalks.

For those rare instances when ready mixed concrete may not be available, it is good practice to make a trial mix on the job consisting of 1 part cement to 2¼ parts sand and 3 parts gravel or crushed stone. Or, if proportioned by weight, the mix should consist of 94 pounds of cement, 215 pounds of sand, and 295 pounds of coarse aggregate. Either formula produces 4½ cubic feet of concrete for each bag of portland cement.

Use only enough water to produce a concrete that works readily and does not segregate. Under ordinary conditions, about 5 gallons of water per bag of cement is recommended. Concrete with a slump of 3 inches permits proper placement for sidewalks.

Sometimes a trial batch proves unworkable. If you run into this problem, vary the quantities of sand and gravel or crushed stone. Avoid changing the amount of water. Too much mixing water results in an inferior product. Excess water reduces the strength of the concrete.

In placing a sidewalk, the contractor should first size up the location, determine the appropriate dimensions, and prepare the subgrade. As on any job, he should round up adequate forms and suitable equipment.

A walk should be at least 5 feet wide if it serves an area of heavy pedestrian traffic. A width of 6 feet is even better. Such a width permits a couple walking abreast to pass a third person without crowding. An even wider sidewalk is desirable as an approach to schools and churches.

In most locations a sidewalk need be no thicker than 4 inches. But if the walk serves a business area or a shipping center, a thickness of 6 inches is desirable. Otherwise heavy loads may soon break the surface.

Contractors at one time built sidewalks in two layers. They had the idea that a base course and a wearing surface added up to a better product than one-course construction. But experimentation and testing have now proved otherwise. A single layer is easier to place and is just as strong as a two-course walk.

Remove all sod and weeds from the subgrade. Fill the sink holes, then tamp the surface to a firm, level base. Sometimes a fill is necessary to bring a walk to the proper grade level. Use gravel or crushed stone for such fills. Allow the fill to extend a foot or so beyond the edge of the walk.

Drain all subgrades thoroughly. A water-soaked under-surface can lead to trouble long after the concrete has been placed. If the ground is wet, cover the subgrade with a 6-inch base of sand, gravel, cinders, or crushed stone.

Use either wood forms or metal forms. Be sure they are strong enough to withstand the pressure of the concrete—a pressure that is greater than one might think for a 4-inch surface. Seal the forms before placing the concrete to facilitate their removal.

Stake the forms to hold them firmly to the line and grade. Stakes should be driven into the ground at 2- to 3-foot intervals. The upper edges of the forms should be level with the finished grade of the walk. Reusable steel construction stakes can save time and money in forming sidewalks.

To assure a compact surface, leave the newly placed concrete slightly higher than the intended finish level. Once it is placed, the concrete is tamped. Tamp it thoroughly, making sure that it is compact and firm. Spade along the edges to eliminate air pockets.

Level the tamped surface with a strikeboard. A long-handled wood float often is helpful in smoothing out irregularities. Work with the strikeboard or float until the water glaze almost disappears. If necessary, fill any depressions with extra concrete. Round off the sides with an edger to prevent chipping.

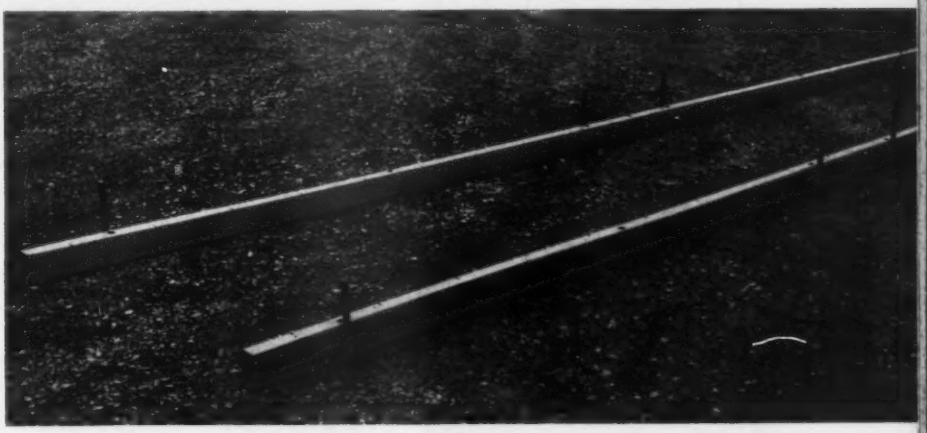
In most instances it is advisable to finish sidewalks with a slightly rough surface. Otherwise the pedestrian may have an insecure footing on wet days. The long-handled wood float produces a grained, nonslip surface. Even grittier results can be obtained with a small wood float or a hair broom.

Occasionally a builder is called upon to make a sidewalk with a smooth finish. For such jobs smooth the surface with a steel trowel or steel float, but avoid excessive troweling. Too much troweling brings water and fine material to the top. A chalky finish results.

Equipment is available for placing sidewalks

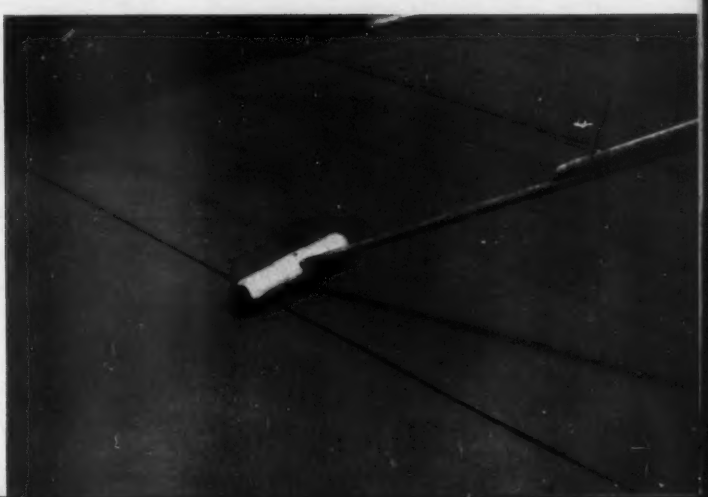
A thoroughly tamped granular subgrade can be an important factor in the performance of a sidewalk.

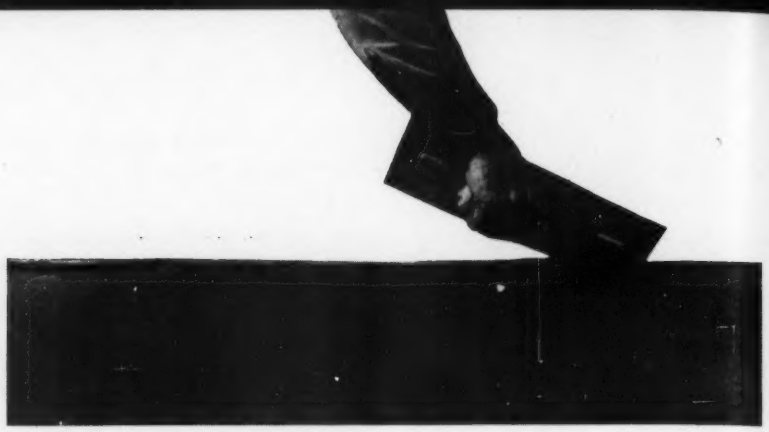
Forms may be of wood or metal, but in either case they must be staked in such a way that they are held rigidly to both line and grade. Steel stakes make for easier penetration of subgrades and show real economy over a short period of time.



A darby or a long-handled wood float is the preferred tool for leveling raised spots and filling hollows in sidewalk surfaces.

The use of a small wood float for finishing will produce a desirable gritty, non-skid surface. A similar result and somewhat better appearance can be achieved by drawing a hair broom over the concrete before it has set.





Forms can be stripped more rapidly, and with less danger of damaging still green concrete, if the concrete is cut free with a steel trowel.

BELOW: If a smooth surface is desired for some reason, the steel trowel may be used for finishing, but excessive troweling should be avoided at all costs.

Chipped edges can be prevented by running an edging tool along the margins adjoining forms and expansion joints.

BELOW: Contraction joints should be spaced at intervals of 5 or 6 feet in the length of a sidewalk. A groove is first made to a depth of 1 inch, and then the joint may be finished with a double edger.

Some provision for curing is essential if sidewalks are to perform satisfactorily. Here a fine spray of membrane curing compound is being used to accomplish this important purpose.

automatically. One machine screeds, tamps, and floats at the rate of 1,600 lineal feet per hour. Two men operate the machine. One man feeds concrete to it, and the other handles placement.

No sidewalk can perform satisfactorily unless it is properly jointed. Without joints, the expansion and contraction caused by changes in temperature would soon cause unsightly cracks. From these phenomena, we get the names of two kinds of joints which belong in almost every sidewalk: (1) contraction joints and (2) expansion joints.

Contraction joints are separation planes between the slabs. As a rule, they are spaced at 5- to 6-foot intervals. In cold weather, these joints open slightly, preventing cracks in the walk.

To form a contraction joint, cut a groove across the newly placed walk to a depth of 1 inch. Use a T-bar to make the groove. Allow the concrete to stiffen, then withdraw the T-bar. Edge the joint by holding a double edger against a straightedge. The straightedge assures a neat, straight line.

Some builders groove a joint successfully with a trowel. But, unlike a T-bar, the trowel is difficult to handle, and there is a possibility the groove will be irregular. Unless you have a steady hand and an eye for a straight line, stick with the T-bar.

The other kind of joint—the expansion joint—consists of a premolded strip of material. It should not exceed ½ inch in thickness, and many engineers believe that a ⅜-inch thickness may be preferable. Expansion joints should be placed at approximately 100-foot intervals in uninterrupted runs or wherever a walk meets another walk, a driveway, a building, a curb, or a rigid object such as a lamp post.

The use of very thick expansion joints at less frequent intervals is not advisable, since this practice is almost bound to create an eyesore when the thicker material extrudes under compression. Expansion joints should be placed either flush with the finished surface of the slab or about ¼ inch below. Under no circumstances should they be allowed to protrude above the surface to constitute a safety hazard.

It is just as important to cure the concrete in a sidewalk as in a highway, but for some strange reason this has been a difficult idea to sell to builders. The strength of concrete is in large measure a result of the hydration of the portland cement, and portland cement must have moisture in order to hydrate. Many construction men actually talk about drying out slabs in a hurry, as though this were desirable, whereas there is actually the greatest need to retain moisture as long as possible.

Membrane curing compounds, either sprayed on as a liquid, or hand spread in powder form, are among the more convenient materials to use for curing sidewalks. Some products of this type contain white pigments which are said to provide protection against either heat or cold during curing. Membrane curing compounds should be applied immediately after the concrete has been finished. There are also many types of polyethylene film, reinforced papers with plastic coatings, and combination materials, all of which are capable of providing desired protection while the concrete gains strength. Water soaked canvas, burlap, earth, sand, or straw also have their proponents.

Ideally, 7 days of protection would be most desirable. Since there is a need, particularly in this area, to be realistic, the builder should make it his business to see that some type of protection is provided for at least 3 days, even if it is nothing more than sprinkling at regular intervals during daylight hours.

Heavy loads should not be applied to a newly placed sidewalk for some time. If a driveway passes over the walk, it is preferable to allow at least 30 days for proper hardening. Failing this, adequate protection may be provided by covering the driveway portion of the sidewalk with wood planking at least 2 inches thick. Otherwise, trucks and automobiles may soon damage the slab.

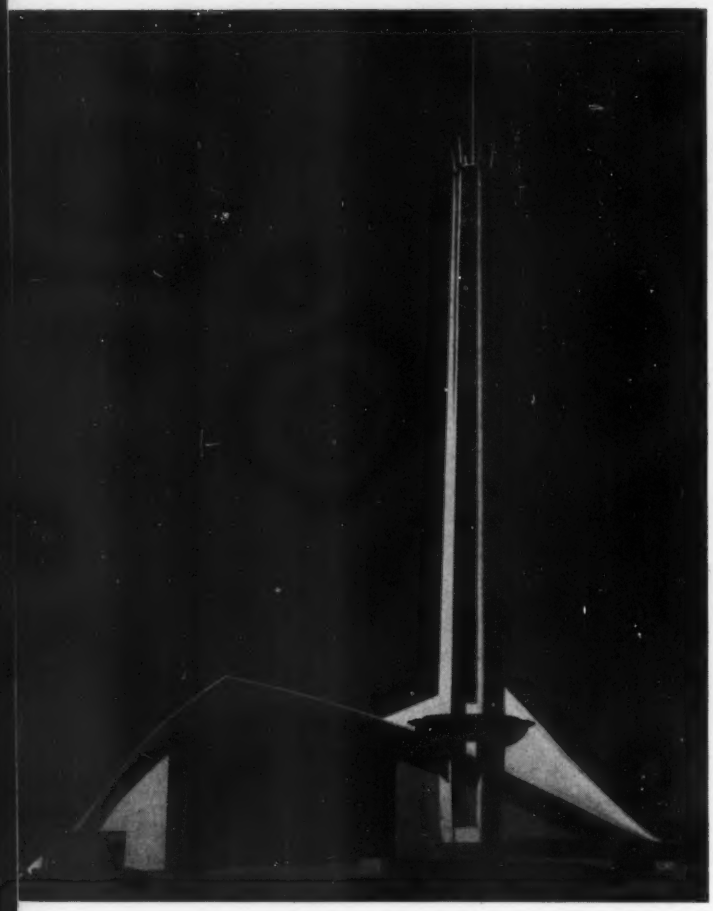
Ideally, sidewalks should be constructed well in advance of winter. Placed in the summer, they have plenty of time in which to develop strength before the freezing and thawing cycle starts. Salt should not be used for removing ice and snow during the first year a sidewalk is down. Unless the concrete contains entrained air, salt should never be used, for it can cause serious and disfiguring surface damage.

In spite of the advantages of summertime placement, there is no reason why the job cannot be tackled in the winter. If the proper methods are used, cold-weather work is just as successful as June and July efforts. It is better to work in the winter than to pass up a job that needs to be done.

Be sure the mix has a temperature of between 50 and 70 degrees F. when it is placed in the winter. When the air temperature approaches freezing, cover the newly placed concrete with heavy paper. Put an insulating blanket or a layer of straw 10 to 12 inches deep on top of the paper. Keep the protective covering on the concrete for the first 3 days after placing.

A mix containing high-early-strength cement should always be used for winter concreting. The addition of calcium chloride accelerates hardening, thus reducing the time needed for protective coverings. The chief objective is to make sure the concrete cures without freezing.

As we observed at the beginning, the need for good initial sidewalk work, as well as for good replacement work, is urgent. The situation presents both a challenge and an opportunity to every concrete contractor, but particularly to the contractor who recognizes that there just can't be any acceptable excuse for bad sidewalks. END



Modified H/P Shell Roofs a Church

The dramatic h/p roof shape, and a 96-foot high illuminated concrete and copper tower, make the St. Charles Church in Spokane, Washington, an outstanding attraction both day and night.

HYPERBOLIC PARABOLOID thin shell roof construction has now scored a number of significant successes in the United States, and the use of this dramatic design concept is no longer automatically newsworthy. But its use in a recent West Coast construction project has imparted some new dimensions, both esthetic and economic, which are worthy of comment.

The project in question is an 800-seat church in St. Charles Catholic Parish, Spokane, Washington. The architects designed a plan which would provide the greatest seating capacity for the area of the proposed building and give maximum proximity to the altar. A fan-shaped design showed the greatest promise. While a full h/p roof was not right for this shape, a modification of a parallelogram offered the perfect answer to the problem. Fortunately a member of the firm of architects was also a structural engineer who could work out the details of prestressing in a new departure from the basic h/p.

Using the h/p eliminated the need for any supporting pillars, thus allowing for greater seating capacity. Another Seattle church of ordinary rectangular shape, built in 1948 at a cost of $400,000, seats only 600. Against a probable 1959 replacement cost of $480,000 for this structure, the St. Charles church was built for $350,000 and seats 800. One economy of the h/p construction was that the shell form reduces the area of the perimeter walls.

The basic h/p was modified to fit the interior plan as conceived by the architects, making one portion of the roof larger than the other. Thus, the large portion of the h/p covers the sanctuary, and the smaller portion covers the vestibule and baptismal font. The roof is 151 feet by 140 feet, which the architects believe to be the largest of this type in the country.

Because the form of construction was new to the Spokane area, contractors were somewhat reluctant to make bids until the architects con-

FILE: Thin Shell

structed a model which demonstrated that the h/p could be formed with straight, ordinary dimension materials. The architects planned for pretensioned concrete design using high-tensile steel cables (four ¼-inch strands per cable) varying in spacing from 12 to 24 inches on center. The size of the shell and the expansion and contraction due to weather extremes in Spokane required prestressing to avoid serious effects of normal shrinkage.

Construction began with the placement of tubular steel scaffolding to support 2 by 10 stringers, seven feet on center. Joists were then placed 24 inches on center, all parallel to one outer edge or the other. Over the joists 1- by 6-inch strips were placed 16 inches on center. Rigid insulation 1½ inches thick was put over this to serve as forming material, plaster base, and as insulation in the final structure.

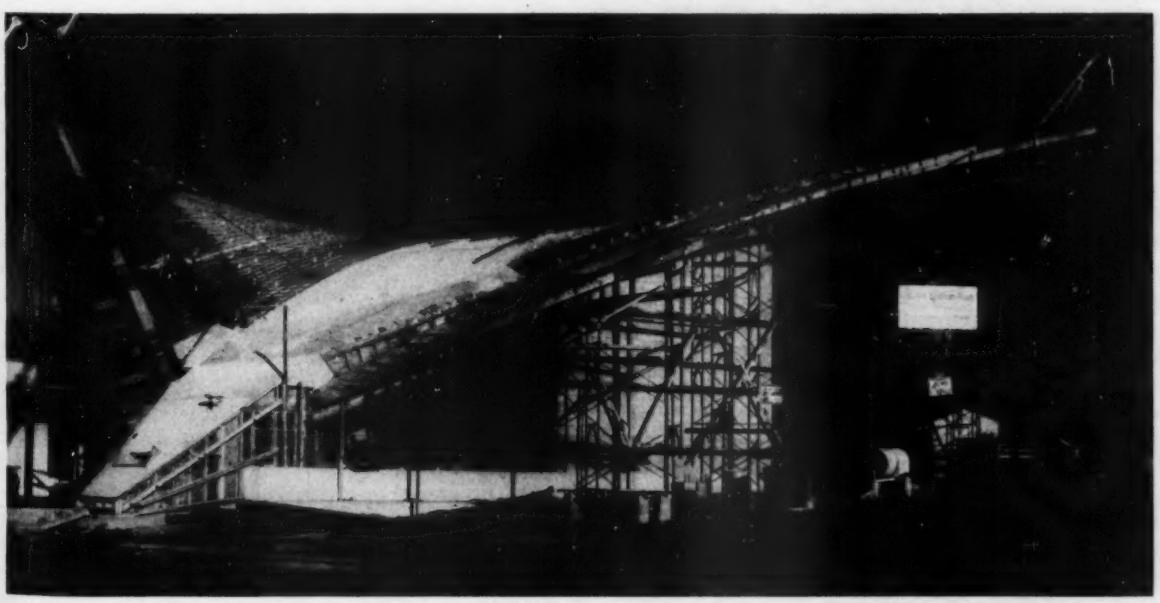
The next step was to place the high-tensile steel cables for post-tensioning after the concrete was set. Since only a portion of the basic h/p was used, the shell was out of balance because of the unequal areas on either side of the line drawn between the supports. To bring the roof into balance, normal concrete made of sand and gravel aggregate was used in the smaller area, and in the larger one lightweight concrete with expanded shale aggregate was used. Both mixes were made to attain a compressive strength of 3,000 psi at 28 days. Subsequent tests indicated strengths exceeding this minimum were attained. The shell is three inches thick on the large area, and five inches thick on the smaller area.

The pouring sequence had to be carefully worked out to preserve the balance of the structure. Before pouring the abutments, a 20-foot band of normal concrete was placed sweeping across the shell between the abutments, and tensioned to allow for shrinkage being taken up. After the abutments were cast, a 20-foot strip of lightweight concrete was placed on the larger area, and a 10-foot strip of normal concrete on the smaller area. Such strips were cast alternately until the entire shell was finished. After it was rough screeded, the shell was wood-floated. The concrete was cured with polyethylene film.

After the concrete had attained a 3,000 psi compressive strength, the entire shell was tensioned to produce a compressive load of approximately 350 psi throughout the structure. Between the abutments and under the floor slab a tie beam 14 by 36 inches was poured with 8 high-tensile steel cables in it. After the abutments had been cast and had attained the proper compressive strength, the tie beam cables were post-tensioned so the steel was stressed to 150,000 psi.

Architects for the church were Funk, Murray, and Johnson of Spokane and the general contractor was Vern W. Johnson & Sons, Inc., of Spokane. T. Y. Lin & Associates were consultants on the prestressing. END

Here the roof is seen with the abutments completed and the shell partially cast. Note edge beam reinforcing and the steel cables for post-tensioning.



NO FINES CONCRETE . . .

It's been around for some time, but may be well worth re-valuating now as a means of extending the market for cast-in-place concrete in the low-cost housing field.

NO-FINES CONCRETE (sometimes referred to as porous or open-textured concrete) is, as the name indicates, concrete consisting of coarse aggregate, cement and water—fines being omitted entirely. Some of the advantages are impressive.

One of the main advantages of no-fines concrete results from its relatively low hydrostatic pressure when wet. The hydrostatic pressure of no-fines concrete is on average only about one-third that of dense concrete. This circumstance, coupled with the even grading, eliminates segregation even when the material is discharged from quite a high level, and allows very large formwork units to be used. Some builders cast no-fines in lengths of 60 feet and from heights up to 25 feet.

The nature of no-fines concrete is such that it has a relatively high proportion of interconnected voids but practically no fine capillary pores. This means that transfer of moisture by capillary attraction does not occur and that with an external rendering to prevent wind pressure from forcing water through the wall, the construction is waterproof. (With regard to the effectiveness of the rendering, it is generally accepted that water penetration is limited to a distance equal to twice the diameter of the coarsest aggregate particle). With no-fines concrete the danger of dampness is remote unless there is bad detailing, or a concentration of cement grout in the wall as a result of using too wet a mix. Cracking of the rendering is another obvious danger.

The weight of no-fines concrete depends on the type of aggregate used. In general, however, the no-fines mix will be only about two-thirds of the weight of a dense concrete made with the same aggregate.

The total shrinkage of no-fines concrete on drying is about half that of a dense concrete made with the same aggregate. The rate of shrinkage is also much more rapid. Of the total shrinkage movement, it has been found that 50 to 80 percent takes place in the first 10 days, whereas for dense concrete only 20 to 30 percent would have occurred in the same period. This means that there is much less danger of the rendering cracking on a no-fines wall. Because of these great differences in rate of shrinkage, care must be taken when using combined no-fines and dense-concrete construction.

A 10-inch no-fines wall, rendered externally and plastered internally, has a heat transmission value of 0.30, which is the same as an 11-inch cavity brick wall. Even better thermal insulation can be obtained by using clinker or crushed brick as the aggregate; however, the problem then arises of insuring that these materials are inert. The noise-insulating value of no-fines concrete is the same as that of brick.

Any sound aggregate which is free from clay or dust and which is rounded or roughly cubical in shape may be used for no-fines concrete. Aggregates containing soft, friable, thin, flaky, elongated or laminated pieces totaling more than 10 percent by weight should not be used. A shale content greater than 1½ percent also makes the material unsuitable. Washed gravel and crushed limestone are ideal aggregates. It is good practice to use washed river gravel which passes a ¾-inch sieve, with not more than 10 percent passing a ⅜-inch sieve. Some research has also been carried out with smaller aggregates, although economic advantages then begin to fall away. It has been found that ½- to ⅜-inch aggregates are satisfactory with regard to strength and water resistance. Aggregates graded ⅜ to ¼ inch give mixes which are water resistant but lower in compressive strength. They offer, however, the advantage of nailability.

A typical no-fines mix calls for one sack of cement to 10 cubic feet of aggregate, which gives a volume proportion of 1 to 8. Slightly leaner mixes 1 : 8½ and 1 : 9 have been used satisfactorily on some projects and theoretical studies have shown that 1 : 10 or even 1 : 12 mixes with heavy aggregates can be satisfactory.

Lightweight aggregates can also be used for no-fines concrete when exceptional thermal insulation or lightness is required; the strength of the mix will, however, then be reduced somewhat. With such aggregates the mix ratio should not be greater than 1 : 6.

Water/cement ratio is a factor which is more critical with no-fines than with dense concrete, since it exerts considerably more influence on the strength. The amount of water must be sufficient to coat each piece of aggregate with a continuous film of cement grout, so that all the pieces will

lock together to form an open-textured mass. It is important that an excess of water be avoided; otherwise the grout will tend to be washed off the aggregate, thus weakening the mix and filling the voids. By filling the voids in this way, pockets of dense concrete are formed which will lead any penetrating water through the wall instead of allowing it to run down harmlessly close to the outer surface.

The quantity of water needed varies according to the aggregate used and atmospheric conditions. In general, however, 4 to 4½ gallons per sack of cement are used. With very porous aggregates it is good practice to first spray the material with water to insure good moisture penetration and thus prevent undue loss of mixing water.

No-fines mixes generally have a cylinder strength of 300 psi at 7 days or 600 psi at 28 days with ¾-inch aggregate. The bending and shear strengths of a comparable mix are only 30 psi at 28 days. The bonding strength of no-fines concrete is low and for this reason walls are usually designed to avoid the use of reinforcement. If reinforcement is included it should be coated with cement grout before being placed in the concrete; in this way it is possible to obtain a bonding strength of around 40 psi, which is about half that for dense concrete. From the foregoing figures it is obvious that from the strength viewpoint the use of no-fines concrete is limited; heavy eccentric loadings and long spans must be avoided. The maximum size of unsupported opening for windows and the like is about 5½ feet. This handicap is readily overcome in practice, however, by using precast lintels of dense concrete.

No-fines concrete should be placed within 20 minutes after mixing. After this period it is definitely undesirable to add extra water to try to increase the workability. When the material is to be delivered in ready mixed concrete trucks, it is important that the delivery units be equipped to introduce water in transit.

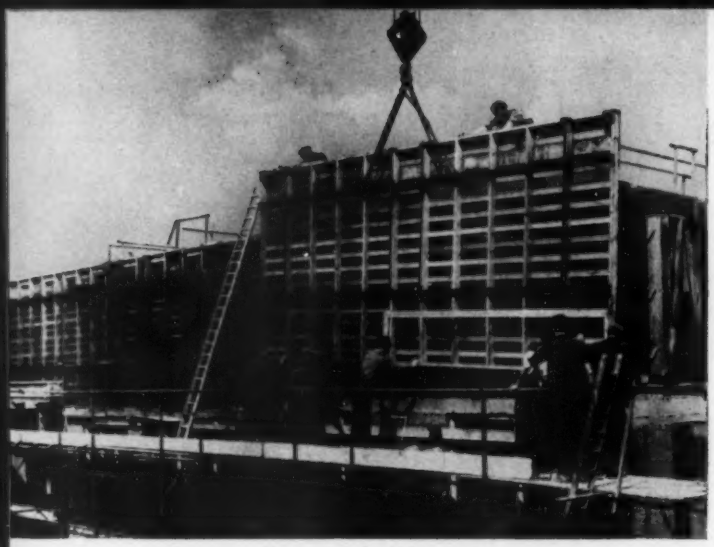
The only compaction needed in no-fines construction is a light rodding to insure that the form is filled completely without bridges or large voids. Since no-fines concrete does not flow as easily as dense concrete, these bridges form relatively easily over even minor obstructions, such as protruding nails; on the other hand the fact that the mix will not segregate, because of its even grading, means that placing from a height of 25 feet usually gives sufficient compaction by gravity alone. Placing under windows or around other obstructions requires considerable care and some ingenuity in the design of formwork. All placing should proceed continuously in horizontal layers. The practice of allowing the mix to build up in the forms on a slope, while awaiting further deliveries, is detrimental since it invariably leads to the formation of a plane of weakness.

This photo shows how a no-fines concrete surface looks before it is rendered.

This handsome four-story apartment building in London, England, is a fine example of some of the work being done there with no-fines concrete finished with a rough-cast rendering.

Temperature conditions for placing no-fines concrete are the same as those for dense concrete. The usual precautions should therefore be taken in near-freezing or very hot weather.

As stated earlier the low hydrostatic pressure of no-fines concrete permits the use of very large, lightweight forms. Frequently, because of the absence of cement-sand slurry, the form may consist of only open-steel mesh or expanded metal on a light timber framing. The strength of the forms and the bracing applied must, of course, be sufficient to withstand the pressure of the concrete without deformation. Usually, however, it is found that the main design factor is the need to make the forms sufficiently strong to withstand repeated use, transportation and handling. Experience has shown that expanded metal will normally withstand at least 25 placings, and the



Workman placing a single-story external wire-mesh form for a multi-story apartment building. Note the dense concrete floor slab.

timber frame about 100 placings. Connections should be simple for rapid erection and stripping. For economic and strength considerations the formwork should rarely be less than a full story in height, so that placing of a complete wall can proceed as one continuous operation.

Under normal conditions no-fines concrete can be stripped the day after placing. Opinions differ as to how soon load can be applied to the wall; theoretically three days should be allowed to elapse, although loading directly after stripping is frequently practiced without any detrimental effect. Most authorities recommend a standard 72-hour curing period.

Expansion joints are necessary only when the walls are over 80 feet long. Construction joints should be avoided, and should never be vertical or on a slope. If a construction joint is unavoidable, the surface of the existing concrete should be wire-brushed clean to expose the aggregate and then recoated with brushed-on cement grout. Care must be taken not to use too much grout and thus to fill the voids. The new lift should then be placed immediately. In practice this procedure, with a deep form, may prove very difficult to carry out, unless the formwork has been designed for it or can be modified to allow access.

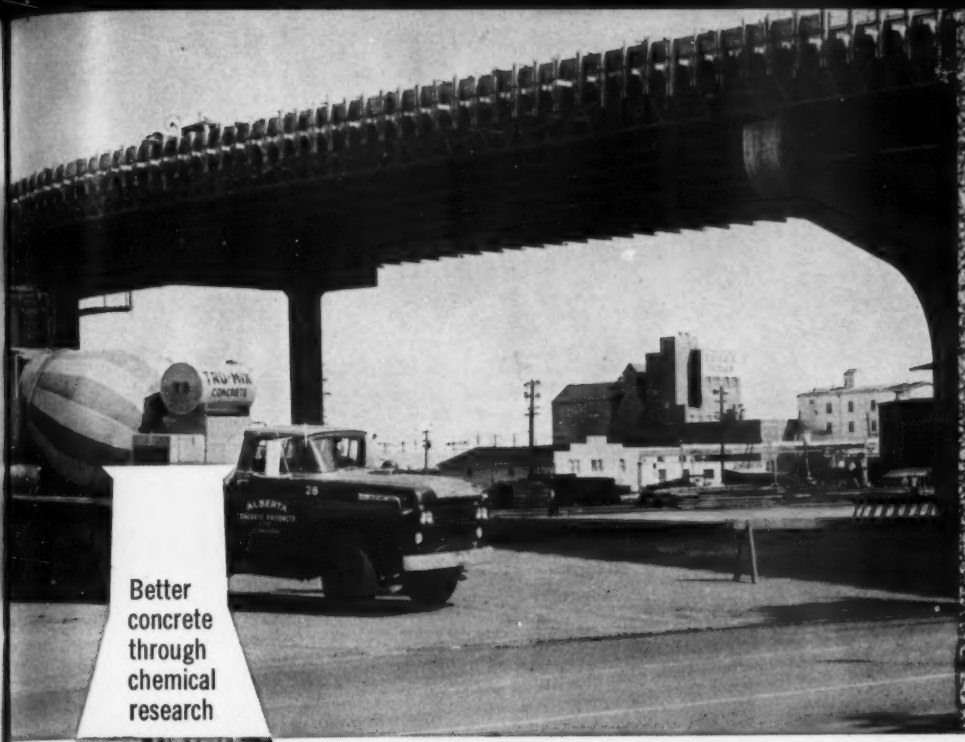
Up to a height of 5 stories load-bearing no-fines walls are used without a frame of normal dense reinforced concrete. The usual practice is to place a 2-story dwelling in one lift; thus for 5 stories a single-story form is used for the ground floor with a 2-story form for the two subsequent lifts, two reinforced concrete floors being interposed as bracing diaphragms. Three stories (approximately 26 feet) is the maximum height placed in one lift, the intermediate floors being added later. Considerable care is necessary in the design of load-bearing structures of this type to insure that the walls brace each other by forming a series of interconnected boxes. Unreinforced heights greater than 5 stories are possible, but wall thicknesses must then be increased to a degree which is both practically and esthetically undesirable.

As with dense concrete construction, careful planning for service outlets in no-fines concrete can save a lot of time and worry later. Nailing blocks or dovetailed timber battens can be cast into a no-fines concrete wall and anchored in the mix by a 4-inch nail or metal tie. Heavier anchors can be provided for sanitary fixtures and the like. Pipe or conduit can be either cast in place or installed within cast-in channels. Such a channel should not be formed in a wall less than 7 inches thick. Cutting away of no-fines concrete for services is undesirable; if unavoidable, it should be done with care to avoid jarring, which can cause progressive disintegration of the concrete.

When it is necessary to patch no-fines concrete, material should be removed from the pocket until the edges are approximately at right angles to the face of the wall. The exposed surfaces can then be cleaned with a wire brush, and the hole filled with a mix of the same consistency as that used in the wall.

Rendering is an essential feature of no-fines construction if the structure is to be made waterproof. Orthodox rendering technique should be followed, allowance being made for the unusual nature of no-fines concrete as a backing material. The open texture of no-fines concrete obviously gives an excellent mechanical key for rendering, but the suction of the material is negligible. For this reason the walls should not be wetted down before the rendering is applied. The application can be by trowel, in either one or two coats, to a thickness of about ½ inch. One-coat rendering is, of course, more economical than two-coat application. Difficulty is sometimes found with one coat, since the lack of suction may not prevent the rendering from slipping. Mixes generally used are either 1 : 3 cement-sand or 1 : 1 : 6 cement-lime-sand. Weep holes or slits should be formed at the foot of the wall, or above dense concrete lintels, to allow any water which might penetrate the rendering to escape to the outside of the wall.

The British contractor, George Wimpey and Company, Ltd., of London, on whose experience much of this article is based, has received high acclaim in the architectural press for the standard of finish achieved. This has been done by imaginative use of different textures; renderings are all rough cast using local or imported colored aggregates in the form of natural stone chippings, which rain tends to make self-cleaning. The rendered areas are broken and highlighted by brick panels in various bonds and colors, on staircase towers or balcony units. END



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INITIAL SET RETARDER

On the job at EDMONTON, CANADA, OVERPASS

Concrete deck slabs for spans up to 95 feet long and 45 feet wide were completed in one pour. To prevent cracking due to deflection of the steel beams as the load was continuously applied, the set of concrete was delayed by the use of DARATARD—Dewey and Almy's initial set retarder. Although temperatures ranged from 65° to 95°F., uniform quality of the concrete was easily controlled by adjusting the addition rate of the ready-to-use liquid retarder.

A liquid air entrainer, DAREX AEA, was used in all exposed concrete to give maximum durability. WRDA, water reducing admixture, was specified in foundations, piers, and retaining walls where retardation was not required.

OWNER: CITY OF EDMONTON. GENERAL CONTRACTOR: BENNETT & FORSTER LTD. DESIGN ENGINEERS: C. C. PARKER WHITTAKER AND CO. LTD. READY MIX SUPPLIER: ALBERTA CONCRETE PRODUCTS LTD. ADMIXTURE SALES & TECHNICAL SERVICE: CON SPEC SALES, LTD.

DEWEY AND ALMY

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WRDA

controls water content

DARATARD

controls retardation of initial set

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Catalog 9/0E
Sweet's Architectural File

The Scraping Straightedge

A useful tool for both checking and correcting slab surface irregularities

RELATIVELY SHORT, hand-finished concrete pavements can now provide pretty much the same smooth riding qualities as mechanically finished slabs. The secret is all in the proper use of a simple scraping straightedge tool which can readily be built in any reasonably well-equipped shop.

The design shown in the accompanying sketches (developed by the Cement and Concrete Association of England) calls for 3-by 2-inch aluminum angle, ¾-inch and 1-inch diameter 10-gauge aluminum tubing, and a small amount of ¼-inch and ⅜-inch mild steel plate. According to the Association, the weight of the edge strip and the flexibility of the entire assembly are especially important considerations for the successful operation of the tool.

It is recommended that the scraping straight edge be put to work immediately after completion of the finishing passes of the vibrating screed. The suggested steps are as follows:

(1) Place the straightedge at the near edge of the concrete with the handle at knee height and push it across the concrete with the handle flexed by downward pressure. A steady pressure and a uniform rate of movement are important requirements.

(2) Make the return pass of the straightedge with the handle straight and inclined upward at shoulder height.

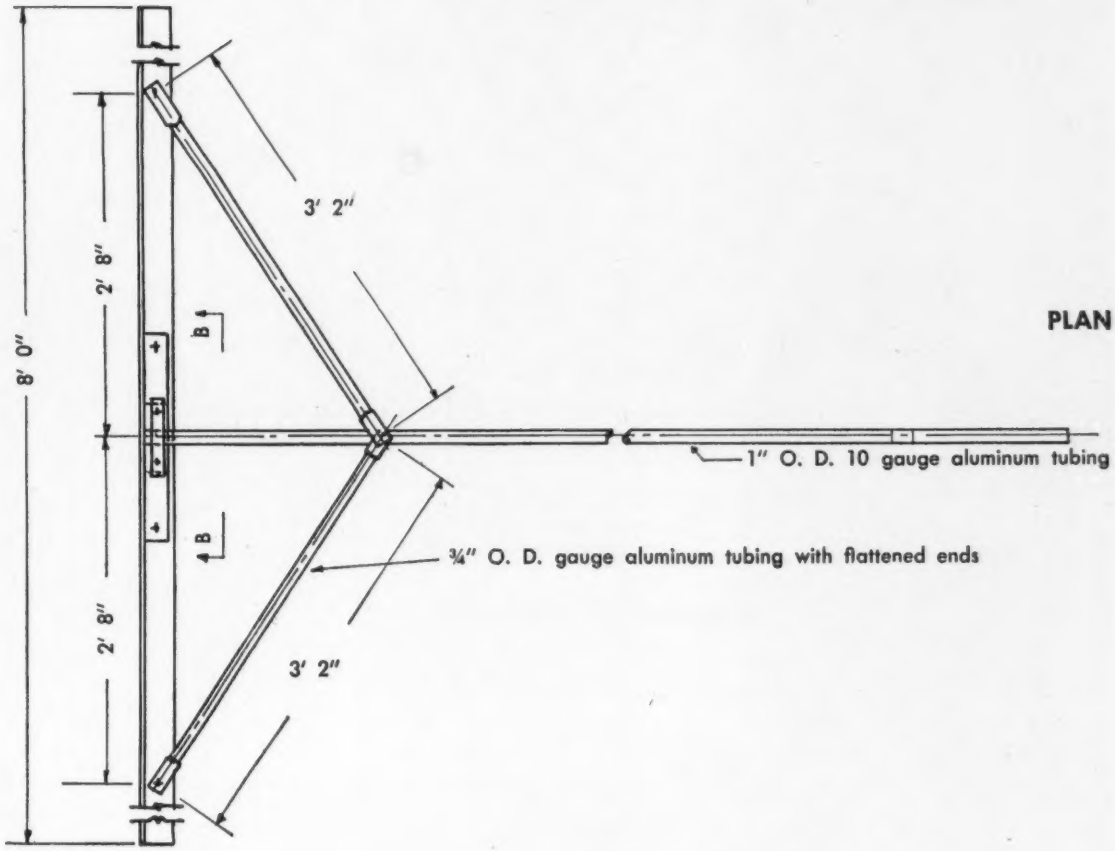
(3) Repeat the process if necessary, but only as much as is required to result in a smooth and level surface.

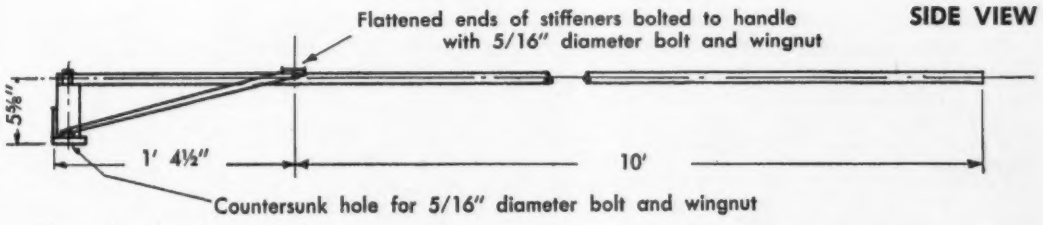
(4) Advance along the slab about 4 feet (half the width of the tool) and keep repeating the process until the entire area has been worked. The surface may then be broomed textured and cured in the usual way.

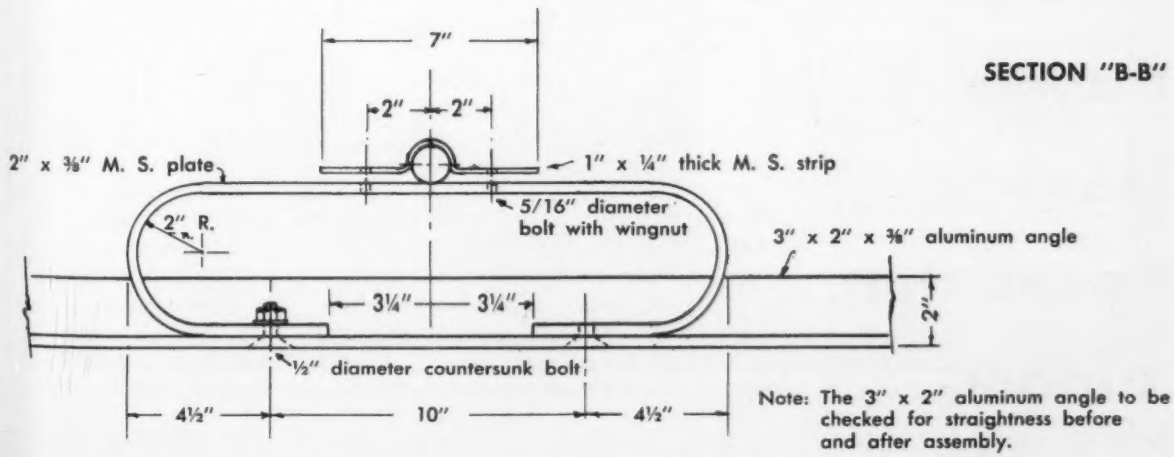
Although reasonably workable concrete is desirable for satisfactory operation of the scraping straightedge, excessive wetness is neither necessary nor desirable. The problem of surface tearing will depend largely on the skill and experience of the operator; trouble of this sort can sometimes be solved by increasing the sand content of the mix by 2 or 3 percent.

Proponents of the scraping straightedge point out that quite apart from its ability to correct irregularities in the slab surface, it provides an effective and constant check on the problem of surface irregularity. Surface tolerances of ⅛ of an inch in 10 feet are reportedly well within the tool's capacity.

SCRAPING STRAIGHTEDGE




SIDE VIEW
Flattened ends of stiffeners bolted to handle with 5/16" diameter bolt and wingnut
5⅜"
1' 4½"
10'
Countersunk hole for 5/16" diameter bolt and wingnut



Note: The 3" x 2" aluminum angle to be checked for straightness before and after assembly.

The two-way entrance to one of the London underpasses. The horizontal struts which support the retaining walls during final concreting can be seen in place.

Site Precast Panels Make Pedestrian Tunnel

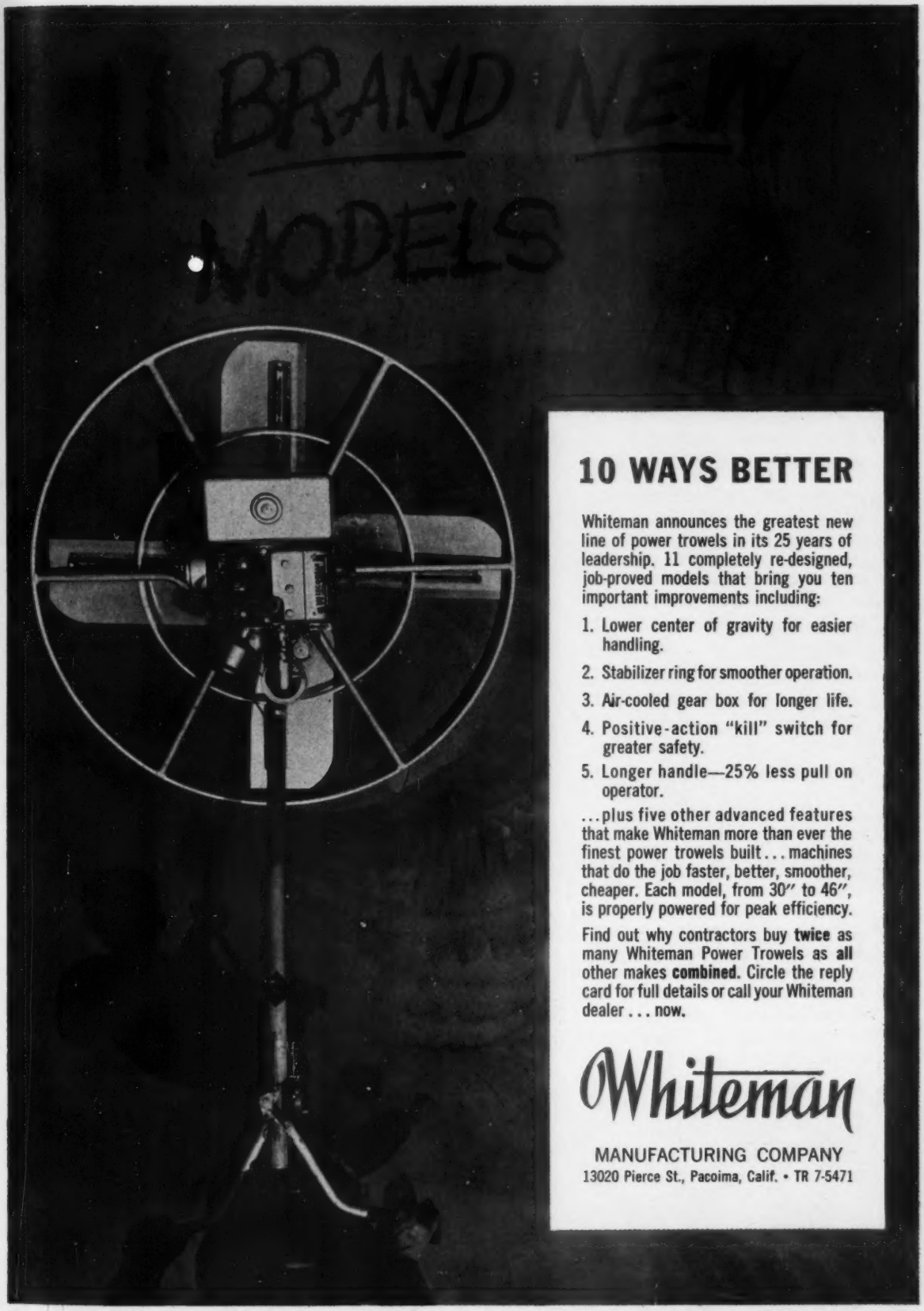
INTEREST IS INCREASING among builders all over the world in the fine economic potentialities of precasting many concrete elements right on the job site, using ready mixed concrete. The accompanying picture shows this technique in use in the construction of a pedestrian subway in England.

The panels being assembled in the photograph were all precast above ground on the job site, and then picked up by crane and lowered into the open excavation. The sections were shored in position as shown with a 3-inch gap between them, after which the joints were rammed solid with mortar to produce what is for all practical purposes a monolithic tunnel.

Projecting stirrup reinforcement was cast into the sides of the panels. During mounting these stirrups are bent out. The units are then arranged so that alternate sections face opposite ways for the stirrups to mesh into each other.

The subways are finished with a granolithic floor topping and rendered or tiled walls, depending on their location. The system is said to result in substantial savings in comparison with either factory precast or conventional cast-in-place construction. END

11 BRAND NEW MODELS



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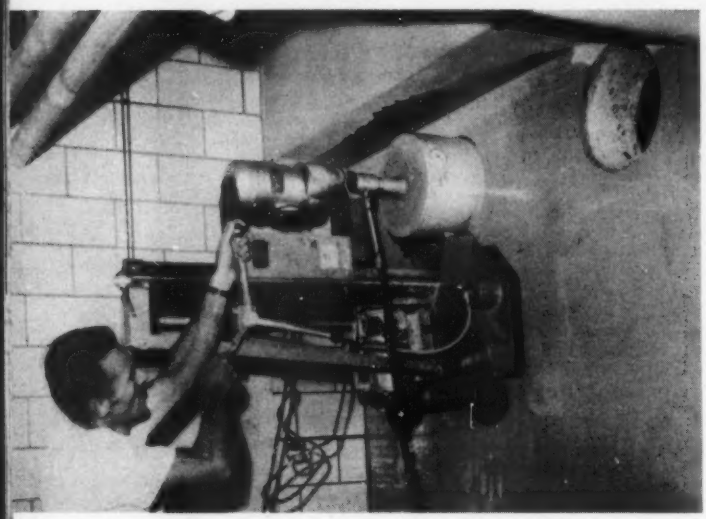
POWER TROWELS•POWER BUGGIES•VIBRATORS•POWER SCREEDS•TRUCK MIXERS

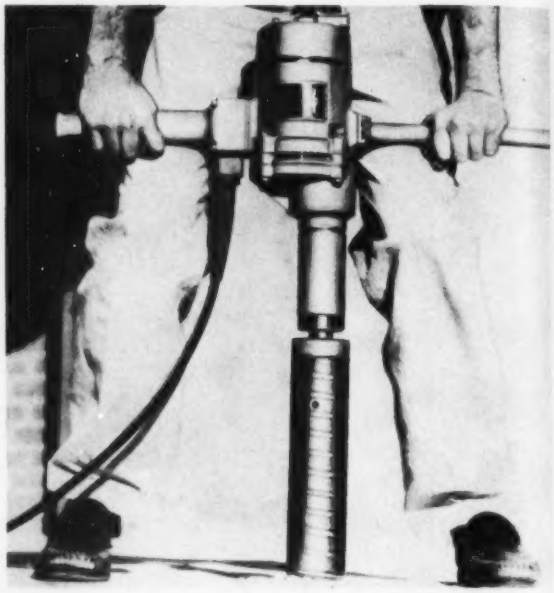
what's new in drilling equipment

The tools pictured on this page all represent quite recent developments by various manufacturrs to facilitate drilling into concrete. Readers who would like to have more detailed information than the brief description provided here are urged to write directly to the manufacturer using the addresses provided.

A special vacuum base holds this drilling machine high on a concrete wall during the drilling of 12-inch diameter walls for steam pipes. Quickly attached with one bolt, the vacuum base has a holding pressure of one ton. This machine includes a gear and rack mechanism which permits rapid feeding and retraction of the bit while drilling. Molco Drilling Machines Inc., 909 Franklin St., N. E., Washington, D. C.

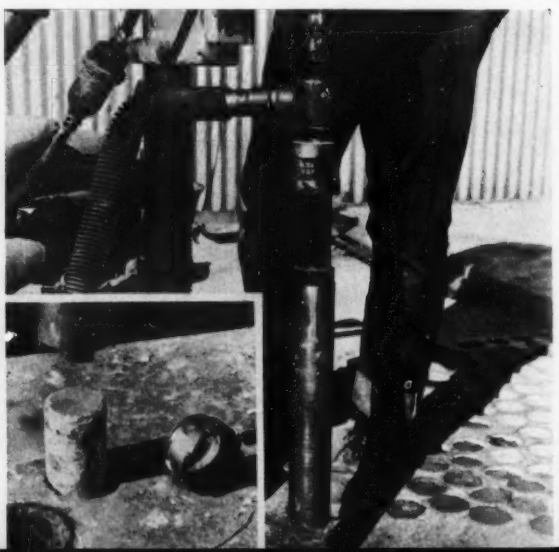


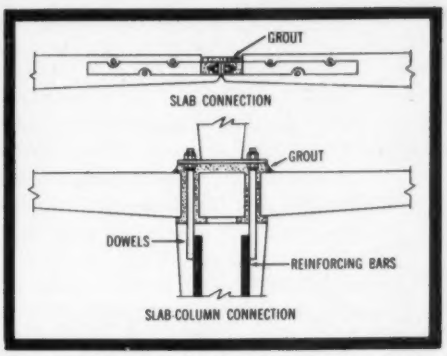
A new portable gasoline rotary hammer uses shock waves for drilling reinforced concrete or masonry. Clean, true holes from ½ inch to 8 inches are cut rapidly by the development of 40,500 shock waves and 8,250 impacts per minute. Also available in portable electric models. Demo Tool Corp., 1001 Colorado Ave., Santa Monica, Calif.

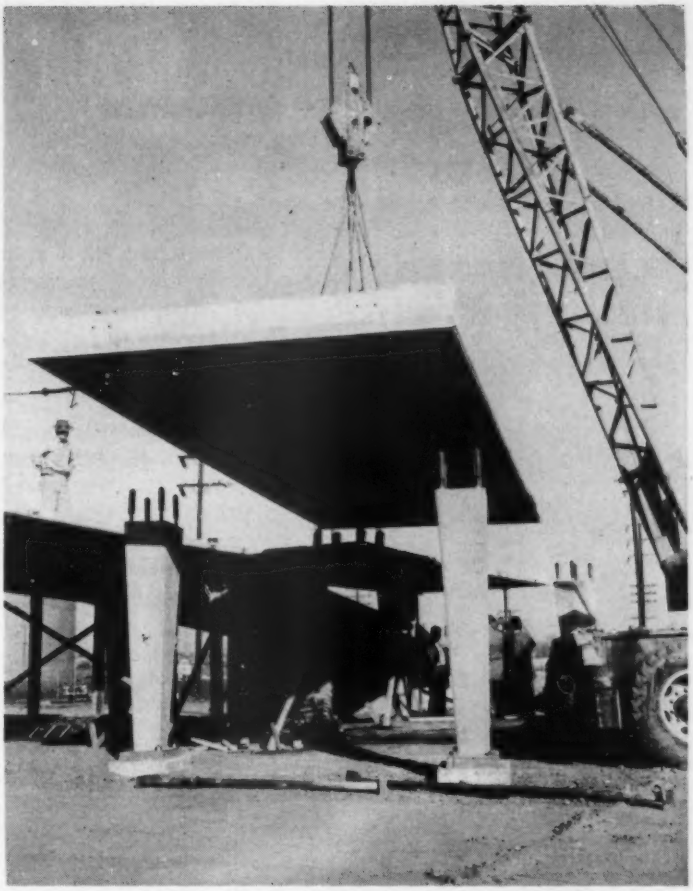


Hole-making speeds of 1 inch per minute or more through fully aged concrete are claimed for this portable tool regardless of hole size up to 6 inches diameter. The bit of this 30-pound machine is designed to bite through rebar from ⅜ to ¾ of an inch in diameter. No water is required. Department H-5, Tool Division, Bill Jack Scientific Instrument Co., Solana Beach, Calif.

Unusual savings in time and labor are claimed for new removable-head carbide-tipped masonry bits which are available in sizes starting at 2 inches. Said to give footage comparable to or better than diamond bits when drilling wet in reinforced concrete. Made primarily to be used in the manufacturer's own drilling machines, but may also be used in diamond core drilling machines that can be modified to produce the correct speed and pressure. New England Carbide Tool Co., 55 Commercial St., Medford, Mass.







PHOTOS THROUGH COURTESY OF TISHMAN RESEARCH CORPORATION, NEW YORK, N. Y., DESIGNERS AND DEVELOPERS OF TIERPARK GARAGES

5000 psi in sixteen hours with SIKA SET

Grout and dry pack mortar with rapid strength development and minimal shrinkage is essential for the fast erection of the new Tierpark Parking Structures developed by Tishman Research Corporation. Composed of only three elements — slabs, columns and ramps — a Tierpark structure is erected within a matter of days.

Mix proportions for high strength grout and dry pack mortar were developed at the Sika Concrete Laboratory. Sika Set liquid, diluted 1:3, added to the dry pack produced compressive strengths exceeding 5000 psi at sixteen hours. Sika Set, diluted 1:4, added to the poured grout produced compressive strengths exceeding 3000 psi at sixteen hours. Proportions of 1 part Type III cement to 1-1/2 parts sand were used.

Structural concrete was initially retarded by the use of Plastiment Retarding Densifier to facilitate finishing — with rapid strength gain as an added bonus to the manufacturer of the precast, prestressed elements.

For full details on Sika Set Shrinkage Reducing Accelerator and Plastiment Retarding Densifier ask for your copies of SET-661 and PCD-59. Offices and dealers in principal cities, sixteen affiliate manufacturing companies around the world. In Canada, Sika Chemical of Canada, Ltd.; in Latin America, Sika Panama, S. A.

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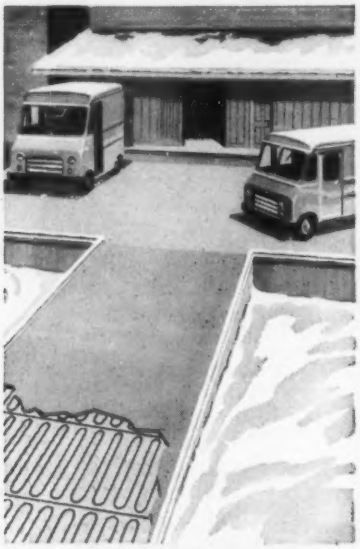

with CHROMALOX tubular snow-bar

With new Chromalox Thermwire Tubular Snow-Bar imbedded in walks, steps and driveways, there's no need to worry about ice-slicked asphalt, macadam or concrete surfaces. Metal-sheathed Snow-Bar installs easily, operates rapidly, performs economically—costs as low as 15¢ an hour for clearing wheel tracks on a 50 foot driveway!

Snow-Bar is available in pre-formed heat patterns for rapid installation—or soft-annealed coils for ease of bending to special patterns. Tubular Snow-Bar combines easily with flexible Chromalox Thermwire cables, tape or bands for special applications. **For full details** on uses in residential, farm, commercial and industrial areas, write for Data Sheet M60103.

WM-5

CHROMALOX ELECTRIC HEAT

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bid registry fights unethical practices

A Bid Registry just introduced in Detroit may be a major step in the crusade against unethical bidding practices responsible for the bankruptcy of thousands of construction contractors throughout the nation.

Aimed specifically at halting construction-tagged "bid-shopping," the plan was successfully employed by Harley, Ellington, Cowin and Stirton, Inc., Detroit architects and engineers, and introduced on behalf of their client, the University of Detroit, in bidding on the University's $800,000 Lansin-Reilly Hall Project.

Paul B. Brown, a vice president of the architectural firm and president of the Detroit Chapter, American Institute of Architects, played a major role in the development of the Bid Registry plan.

"To understand the solution," he explained, "you must first understand the cancerous effect of bid shopping on the industry. It can be described as that practice whereby bidders are played one against the other to the detriment of everyone concerned.

"For example, a contractor calling for bids from plasterers might receive bids of $8,000 from one sub-contractor and $7,500 from another. Behind the scene, he contacts the high bidder, explains that he has been underbid by $500 and succeeds in having the $8,000 bid trimmed to, say, $7,500. He then goes to the $7,500 bidder, repeats his tactics, and gets a new low bid of $6,500.

"Assuming that the original bids were made in all honesty and geared to a fair profit, this process has now forced the final low bidder to perform at an unfair profit for his labor, a break-even point just to remain active, or possibly even at a loss.

"In any event, the sub-contractor who finally is awarded the job at a cut-throat price, is now apt to render substandard service to recapture what little he can of a substantial loss suffered even before his work began. The owner will suffer with a building of low quality.

"The Bid Registry program which we have introduced to combat these evils," Brown said, "has been supervised by Robert Domke, project administrator for Harley, Ellington, Cowin and Stirton, and conducted in cooperation with the Builders and Traders Exchange of Detroit.

"Joint action in conducting the Bid Registry with the Builders and Traders Exchange was encouraged by the Joint Construction Industry Committee of the Detroit Chapter, A. I. A., in the belief that this would encourage industry-wide use of the practice.

"It was Domke's task to enforce absolute adherence to the procedure developed. That is, sub-contractors, when depositing their bids with general contractors, were required to submit sealed envelopes containing exact copies of these same proposals to the Bid Registry by a specified time. It was not mandatory that the same quotations be given to all general contractors or was it necessary to quote to all of them.

"Over the years, various bidding control schemes have been unsuccessfully introduced. This most recent attempt, however, takes into consideration those various plans—their faults and features — and combines them into what is considered the most workable plan yet developed."

Readers of concrete construction who desire additional information may write to Paul B. Brown, Harle, Ellington, Cowin and Stirton, Inc., 153 E. Elizabeth, Detroit 1, Michigan.

ALPHA news and notes from the field

BETTER CONSTRUCTION THROUGH BETTER USE OF CEMENTS

Simple Precautions Improve Hot Weather Concreting

When temperatures hover in the 80's and the humidity is low, it's time to make sure that certain hot weather concreting precautions are observed.

High temperatures accelerate the setting time of concrete and promote rapid evaporation of water. The result is "quick set" or premature hardening which may cause permanent strength damage. Tests have shown that concrete mixed at 100°F. requires about three more gallons of water per cubic yard to maintain the same consistency as concrete mixed at 73°F. You can see how this alone would reduce the strength of the concrete by increasing the water-cement ratio.

Preparations for Placing

Thoroughly soak the subgrade the night before, and sprinkle it just before the concrete is placed so it will not absorb water from the concrete. The mix should be discharged as soon as it is delivered to the job site. Prolonged mixing should be avoided because of heat build-up inside the drum which raises the concrete temperature.

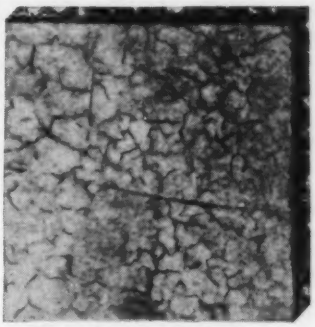
Ample help should be on hand ready to handle the concrete as soon as it is properly mixed.

Avoid the use of strength accelerators in hot weather.

Finishing and Curing

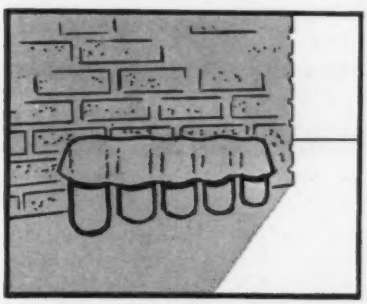
Under extreme conditions in hot weather it may be necessary to shade concrete or use wet coverings until final finishing can be completed.

To counteract the effect of hot, dry breezes, erect wind breaks or use fog nozzles on upwind side of fresh concrete. Start curing operations as soon as concrete has sufficient set to avoid surface damage. When curing is delayed, surface is apt to dry and shrink more rapidly than the lower portion of the concrete slab. This causes crazing or shrinkage cracks.



Crazing cracks. Surface shrinkage cracks result when the surface dries and shrinks more rapidly than the lower portion of the concrete slab.

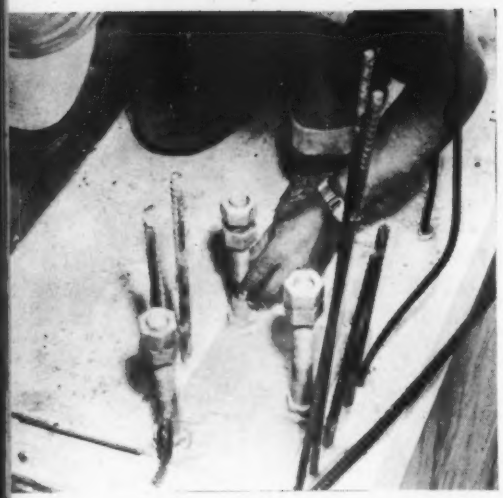
Keep concrete damp during entire curing period, and cure for at least 7 days when durable surface and strength are important.



Concrete test cylinders should be kept shaded, damp and at 70°F. until they are ready to be sent to the laboratory.

If you would like additional copies of this information, ask your Alpha sales representative or write to Alpha Portland Cement Company, Easton, Pa.

ALPHA
PORTLAND CEMENT COMPANY
Alpha Building, Easton, Pa.



Three one-inch round bolts are placed at the correct spot and welded to a steel plate on the Oneida Lake Bridge at Brewerton, New York. The epoxy bonding compound was then applied both to a small portion of the concrete beam and to the plate.

technique for positioning anchor bolts

A technique for positioning anchor bolts for the posts of railings on concrete bridge structures using epoxy bonding compound is said to be faster than the conventional methods with estimated savings of twenty- to thirty-percent. This development precludes the necessity of positioning anchor bolts within the formwork prior to placing concrete. It also eliminates fittings of railing posts, and when properly employed obviates the necessity for shimming. In addition, the expense of tying anchorages directly to main reinforcement and devising methods of attachment are eliminated. This technique is now a standard, developed in the office of the Deputy Chief Engineer, New York State Department of Public Works. It was used on the Oneida Lake Bridge at Brewerton, N. Y., last summer for the first time as far as is known. The concrete fascia beam was cast four and one-half inches below final grade with the required tie bars protruding. Three one-inch round bolts were properly positioned and welded to a seven-by eleven-by one-half inch steel plate. The epoxy bonding compound was then applied both to a small portion of the concrete beam and to the plate. When the epoxy became tacky, the plate was placed on the epoxy prepared concrete surface. No pressure was required. Working strength was reached in eight hours. Specially placed hair-pin bars were then bent over the anchorage assembly. At this time the railing post was attached to the anchor bolt assembly.—Sika Chemical Corp., Passaic, N. J.

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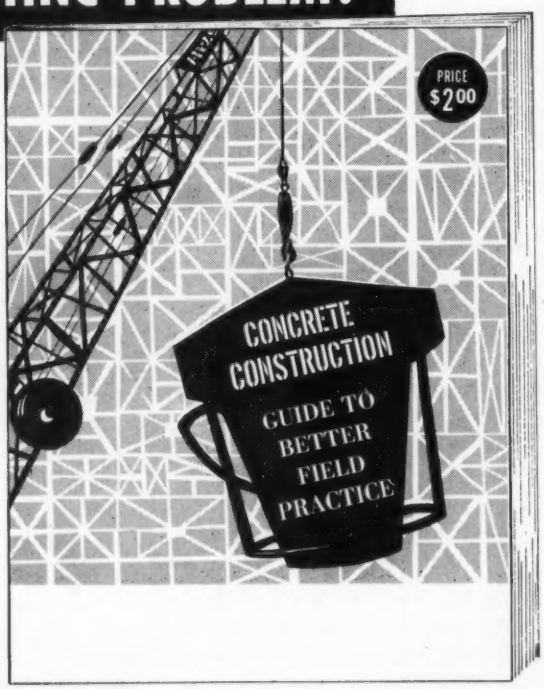

books

Suggested Guide for Field Cost Accounting for Building Contractors. *Published by The Associated General Contractors of America, Inc., 20th and E Streets, N. W., Washington 6, D. C. $2.50 ($1.25 for AGC members).*

Long concerned over the relatively high rate of business failures in the construction industry, the Associated General Contractors of America developed this booklet after consulting executives of some 80 leading AGC building contracting companies about the forms used by their firms. These forms were carefully studied, compared and correlated, and a composite set of forms was developed by a special AGC committee as a suggested guide to improve or initiate a cost accounting system for fellow contractors.

The booklet is presented in three parts: (1) preparation of the project estimate using a standard system; (2) job labor and material cost distribution covering the recording and distribution of field labor and material to a standard cost accounting system; (3) the preparation of cost reports in a manner that will give the company a complete and realistic forecast of the job outcome, and give management a clear picture of field costs vs. the estimated field costs, commitments vs. material and subcontract estimates, and up-to-date and accurate figures for the bank and the bonding company.

The booklet points out that procedures and systems which are understood and used by a company as a standard keep estimate errors to a minimum and make distribution of field labor costs easier. Procedures and systems must be fitted to the company operations, must be as simple as possible, and require the minimum of paper work.

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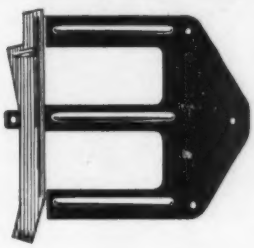

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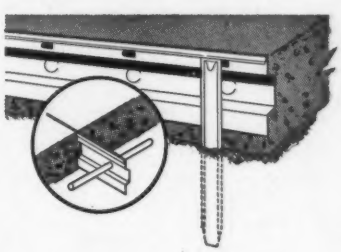

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Elementary Statics of Shells. *By Alf Pfluger. Published by F. W. Dodge Corporation, 119 West 40th Street, New York 18, N. Y. 122 pp. Illus. $8.75.*

This book is essentially a visual presentation of the spatial interplay of forces in shells. The author presents the general concepts of shell theory and discusses the application of shell design, not only to the roofing of large columnless areas, but to such utilitarian functions as boiler, storage tank, and pipeline construction. After defining the basic terms of shell theory, middle surface, shell normal, and so forth, he presents the basic assumptions which justify his visual approach to design.

These assumptions, which permit a cautious analogy of shell theory to the linear truss theory, are preliminary to the central thesis of the book—the membrane theory. This is defined as the intentional neglect of the normal shears, bending moments, and twisting moments in thin shell calculation. Though this general theory may appear oversimplified, its rational basis and its limitations are clearly shown. Moreover, one important chapter employs the rigorous bending theory to satisfy the most common, and seemingly contradictory, conditions of deformation encountered in the approximate method.

Throughout the book, the membrane theory is applied to every general type of shell: spherical, toroid, conical, circular, cylindrical, paraboloid, barrel vaults, and several combinations. Theory is elaborated only when necessary for the solution of the more common problems. All equations are capable of visual interpretation and their results can be interpreted in tables and graphs. A tabulation of membrane theory solutions gives the book a special usefulness for practicing engineers as well as students.

A Picture Dictionary and Guide to Building and Construction Terms. *By Benjamin Lipowsky and Murray Bersten. Published by Arco Publishing Company, Inc., 480 Lexington Avenue, New York 17, N. Y. 25 pp. Illus. (21 plates). $5.00.*

In the first section of this book conventional building and construction terms are given, showing their family or grouping, along with a full definition. The aim here is to provide a principal identity of the technical word or phrase rather than to give an extended explanation of its origin or meaning. To this end, the principal group reference of the word or phrase is given with each definition.

The second section consists of full illustrative diagrams giving the grouping of building terms by families. It is the intent of the authors that this method of presentation of specific terms will provide an opportunity to those engaged in building construction to expand their language of the subject and will form a reference thesaurus with which one can find a word or phrase of building construction that is associated with an idea or concept already at hand.

1960 Supplement to 1958 Book of ASTM Standards — Part 4 — Cement, Concrete, Mortars, Road Materials, Waterproofing, Soils. *Published by American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa. 240 pp. $4.00.*

The American Society for Testing Materials publishes its Book of Standards triennially with Supplements in the intervening years. Industry, government, and commerce are thus supplied with a continuing source of reliable, authoritative, unbiased, and widely-applicable standards. This 1960 Supplement, Part 4, includes 40 standards for cement, joint fillers, gypsum, chemical-resistant mortars, aggregates, concrete, curing materials, waterproofing materials, and soils.

Compilation of ASTM Standards on Cement—C-1. *Published by American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa. 288 pp. $4.00.*

The 1960 edition of this reference volume contains 8 specifications, 26 methods of test and several definitions. Two specifications for laboratory apparatus are also included. Methods added to this compilation since the previous edition cover false set of portland cement (paste method), fineness of hydraulic cement by the No. 325 sieve, and potential sulfate resistance of portland cement. Revisions have been made in 4 specifications and 8 methods retained from the previous edition, and also in the definitions. Changes and additions have been made in the appended Manual of Cement Testing and Selected References on Portland Cement.

Farm Building Design. *By L. W. Neubauer and Harry B. Walker. Published by Prentice-Hall, Inc., Englewood Cliffs, N. J. 600 pp. Illus. $8.50.*

The authors of this book present a complete coverage of the functional and analytical design of farm buildings, including farm houses, barns, sheds, shades, storages, grain bins, silos, animal shelters and septic tanks.

Part I, Structural Types and Functions, describes the basic requirements, technical design, and construction methods of farm buildings. Part II, Materials and Structural Design, emphasizes the achievement of the most economic and satisfactory results and deals with the proper use, efficient design, loadings, and costs of construction materials—poles, rigid frames, arches, reinforced concrete and tilt-up concrete slabs.

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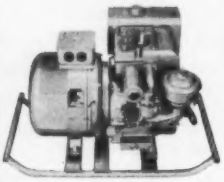

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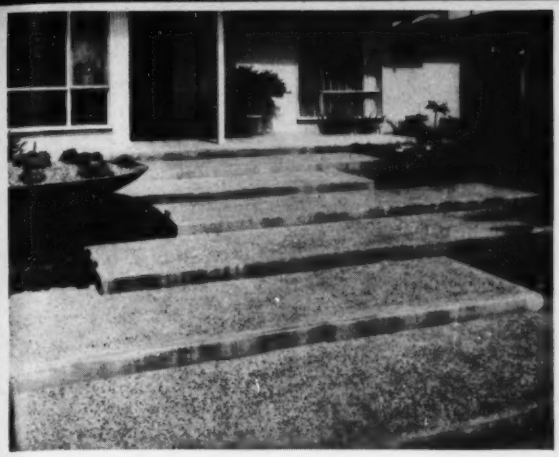
unique concrete building

Built entirely of reinforced concrete, Philadelphia's Hopkinson House is expected to be the tallest such structure in the eastern United States and the tallest apartment building of any kind in Philadelphia. The first large apartment building erected in an urban renewal program, the design, in keeping with basic principles of the Philadelphia Planning Commission and Philadelphia Redevelopment Authority, the 37-story apartment structure will be contemporary in style but will incorporate touches of brick and white marble. Hopkinson House will have two floors below ground and thirty-five above, with 536 apartments, a lobby, a penthouse level, a sunbathing level and a swimming pool. An attended 400-vehicle parking space will be provided below street level. The entire building will be reinforced concrete, using approximately 29,000 cubic yards of concrete. Most of the tall structure will be made with special lightweight concrete using cement manufactured by Alpha Portland Cement Co., Easton, Pa. About 3,400 cubic yards of heavier concrete will be used for the foundation—itself an unusual structure because of its monolithic one-piece design. Concrete for the huge one-piece foundations will be placed continuously on a day and night basis. Final completion of Hopkinson House is set for October, 1962. The architectural firm of Stonorov and Haws designed the development, the builders are R. M. Shoemaker Co., Garber and Cohen, the mechanical and electrical engineers, Garfinkel and Marenberg, structural engineers and landscaping by Saski, Walker and Assoc.



glamorized steps

Modern designers and builders are finding cost-in-place concrete the ideal material for correcting the drabness so often built into residential entrances. To minimize the steep approach to this home on sloping land, the designer wisely called for wide, shallow steps with strong horizontal lines.

The result: an easy climb and a substantial saving through the elimination of terraces and retaining walls. An exposed layer of colored pebbles gives the steps and porch the rough texture now so widely sought while the smooth vertical surfaces of the risers provide contrast and help to articulate the pattern of the ascending steps.—Garman Construction Co., Fort Worth, Texas.

new frontier for burlap

Plain ordinary burlap is progressing beyond the farm and storage barn and making an impression in concrete construction. Fitted with a new look in the form of a white polyethylene coating, it proves to be highly effective as a curing cover for special shaped concrete designs incorporated in bridge work and building construction. Narrow, multi-surface shapes such as railings, decorative figures require a highly flexible, efficient curing material. Liquid membranes are usually ruled out because of the material waste and prolonged application time. Conventional curing papers, on the other hand, seldom have the desired degree of flexibility. When coated with a four mil film of white poly, burlap avoids both disadvantages and at the same time proves to be a respectable curing material. In the field, burlap is wetted and applied to the shape with the non-coated surface inward. The moisture retained in the fiber strands helps to maintain hydration. Exposed to the atmosphere, the white poly coated surface reflects solar heat, keeps the concrete at a more consistent temperature, and prevents moisture from escaping. American Sisalcraft Co., 55 Starkey Ave., Attleboro, Mass.

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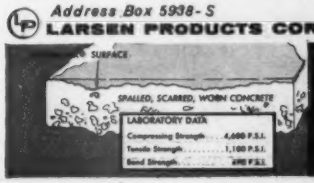

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problem clinic

home building costs

Question: How widely does the cost of home building vary from city to city?

Answer: The latest figures we've seen were created by the Federal Housing Administration for a hypothetical frame house having 3 bedrooms, two baths, kitchen and dining and living rooms; total floor space, 1,138 square feet. In Chicago, which topped all other cities and was 29 percent above the national average, this house cost $14,007. The lowest figure was $9,133 for Knoxville, Tennessee. Cleveland, 21 percent above the national average, was the second from the top. The findings seem to bear very little relationship to size of city. In Philadelphia, for example, the hypothetical house costs only $10,079 to build.

Building Officials Conference

Question: What is the Building Officials Conference of America and who is eligible to join?

Answer: BOCA is a professional organization representing municipal government officials who administer, enforce or formulate laws, ordinances or regulations relating to buildings, housing, city planning and zoning. Active membership is limited to principal governmental officers enforcing or formulating building, zoning or housing laws, but other classifications of membership are broad enough to include virtually anyone with a serious involvement with or interest in construction. BOCA's executive offices are located at 1525 East 53rd Street, Chicago 15.

paving record?

Question: What's the present record for placing highway pavement by a single crew in a single day?

Answer: A Saginaw, Michigan, crew several years ago laid down 5,787 feet of 9-inch paving 24 feet wide in 12½ hours. Even under good conditions most paving crews average around 3,000 feet per day.

concrete and heat

Question: What effect does long exposure to relatively high temperatures have on the compressive strength of concrete?

Answer: Tests conducted on small specimens at the University of Washington showed appreciable strength losses at temperatures over 200 degrees F. Cylinders of 1 : 2 : 4 concrete measuring 2 inches by 4 inches were heated for 4 hours 27 days after casting. Compression tests made on the 28th day showed the following percentage reductions for the temperatures indicated:

TEMPERATURE	REDUCTION
200	18
500	40
800	52
1100	85
1400	96
1700	17

Due to the size of the specimens used in these tests, a much greater surface area was heated in proportion to the mass of the concrete than would normally be true in a structure, and the indicated strength reductions are therefore probably much higher than would occur in a structure. Nevertheless, it seems apparent that major load-bearing con-

crete elements should not be exposed for long periods to temperatures much above 500 degrees F. There are some indications that the strength reduction can be reduced by increasing the time of curing before exposing the concrete to high temperatures.

fireproof vapor barrier

Question: Is there such a thing as a non-combustible vapor barrier material which can be safely used in a work area where field welding is to be done?

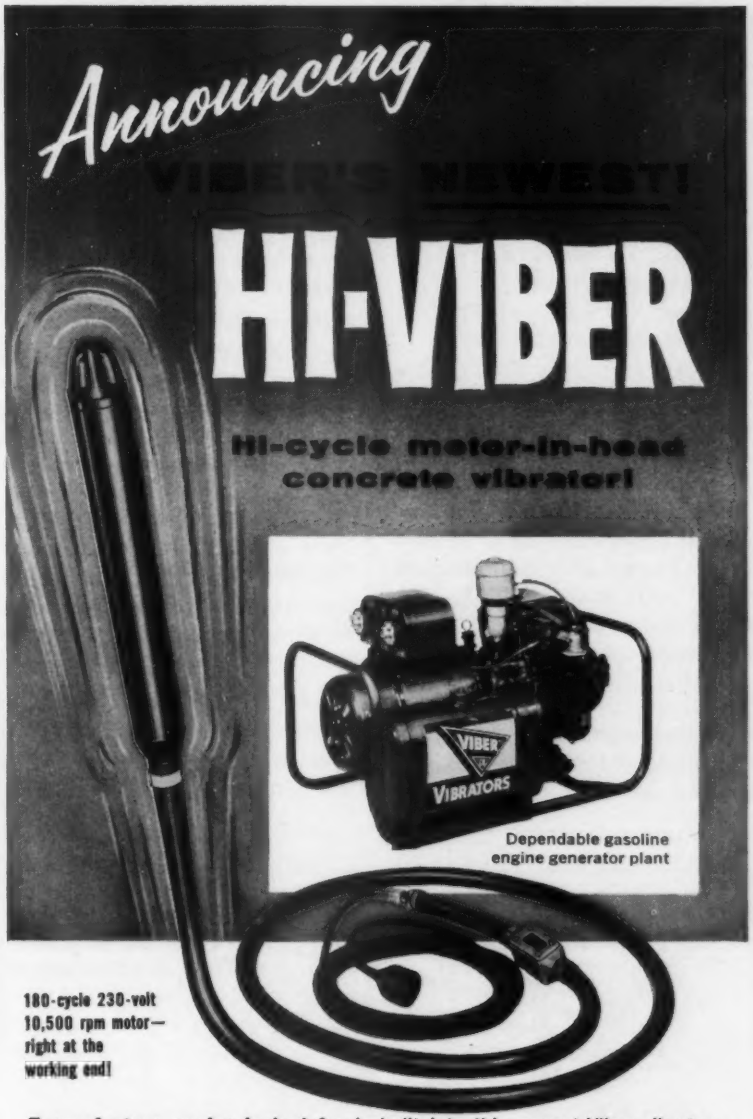
Answer: American Sisalkraft Pyro-Kure is said to be unaffected by sparks from welding. It contains a non-combustible adhesive.

The accompanying illustration shows welders putting together brine piping for a skating rink, working directly over an installation of the non-combustible vapor barrier. It would have been necessary to protect an asphaltic-base material with some other material to prevent burning holes in the vapor barrier.

first sawed joints

Question: When were pavement joints first made in the United States by sawing?

Answer: the first sawed joints are believed to have been done experimentally for a widening job on U. S. Highway 101 near Oceanside, California, in 1945. They were in good condition when examined several years ago.



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it pays to standardize on

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problem clinic

when to strip forms

Question: Is there a rule of thumb for determining when forms may safely be stripped on structures of various kinds?

Answer: Subject to the exercise of good judgment and observation of the concrete when stripping starts, some minimum time allowances are as follows: 24 hours for beam sides and for columns and walls up to 15 feet high; 48 hours for columns and walls over 15 feet high; 144 hours for beams and deck slabs. For major structures it may be desirable to determine stripping time through the use of test specimens made on the construction site and cured under similar conditions.

tensile strength by crushing

Question: Can the tensile strength of concrete be determined from compression testing?

Answer: In some countries in Europe tensile strength may be calculated from data obtained by crushing cylinders on their sides. The method is said to yield good results.

dry cylinders stronger

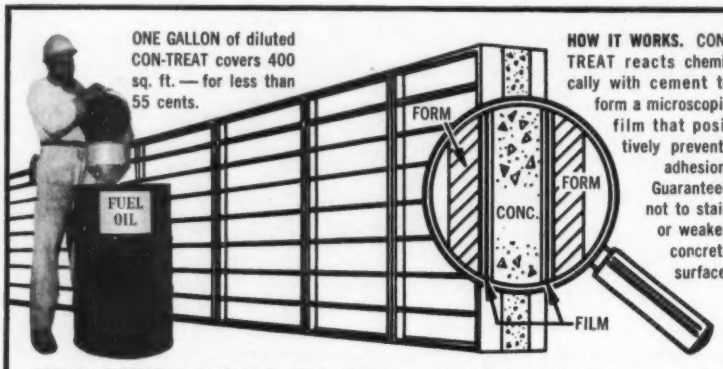
Question: Do thoroughly dry concrete cylinders test higher than wet cylinders?

Answer: Yes, strength may be increased by as much as 25 percent by drying cylinders before they are tested.

molasses storage

Question: What treatment is recommended for the interior of concrete tanks which are to be used for the storage of molasses?

Answer: If the concrete itself is of good quality and thoroughly cured and dried, the chances are that no protection will be needed. Wet curing for at least a week, and air drying for not less than 3 weeks, should be regarded as essential to produce concrete capable of standing up under this type of exposure. An additional margin of protection would undoubtedly be afforded by treatment with such materials as magnesium or zinc fluosilicate, or sodium silicate (water glass).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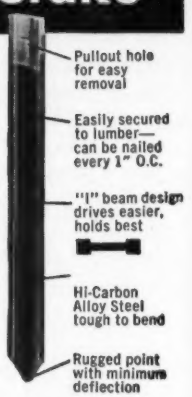
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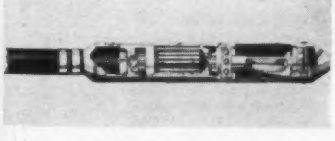
products

fastening tool

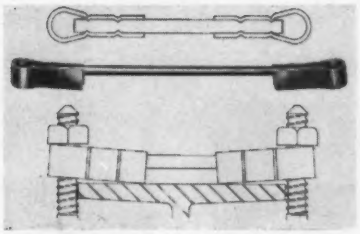
A fastening tool is said to eliminate safety hazards common to stud guns. Instead of starting the fastener away from the material, and accelerating it to high speed before impact, this tool starts the fastener in contact with the concrete and then pushes it in by using a heavy hammer to hit the high mass steel piston which contains a very light, slow burning blank charge. There is no triggered gun action, no initial velocity and acceleration is relatively slow. Shock is, therefore, eliminated, as are the possibilities of explosive spall, ricochet and fishhooking. All fasteners provided are assembled with a washer installed to further prevent danger of over-penetration. Maximum fastener size which can be driven is a ¼-inch-20 stud. Conventional stud guns must be used in heavier fastening applications, Hilti, 73 Southfield Ave., Stamford, Conn.

vibrator

Cutaway view of lightweight motor-in-head one-man vibrator which operates on either AC or DC current at rate of 10,000 vibrations per minute. Featuring a tough, flexible hose and 25 feet of electrical cord, it is available in lengths of 7, 14 and 21 feet.



Head diameter of less than 3 inches permits work in tight spots. Remington Arms Company, Bridgeport, Conn.



new deck hangers

Two new deck hangers for slab construction over steel or concrete beams have been developed recently. The standard hanger is used on all interior beams, and the fascia hanger is for use on exterior beams. Both are available in a variety of sizes for various flange widths. Two one-half inch coil nuts are furnished with each hanger. Write for additional information to: Universal Form Clamp Co., 1283 North Kostner Ave., Chicago 51, Ill.

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An adhesive-backed safety sole which gives positive footing on almost all surfaces is easily applied to any footwear. Made of resinous abrasives with a strong, self-adhering back, the sole safely grips tilted or slippery floors, roofs, decks and steel work and eliminates slipping, skidding on wet, oil-covered or icy surfaces. The material is not affected by water, oil, and gasoline and will not conduct electricity. Write Weather Walker Products, 192 W. Montana Ave., Detroit, Mich.

duct former

A steel or plastic duct former makes circular, oval or rectangular ducts in concrete. In steel, the material is said to be reusable 150 times, and in plastic 50 times. The steel type is recommended for larger-diameter ducts. Both types are available in transportable lengths up to 30 feet. Greater lengths must be welded together on the site. Holley-Edwards Sales, P.O. Box 4818, Jacksonville, Fla.

Figures don't lie, if you examine all facets.
—Bob Sproule

I'D BE THE FIRST to say that calcium chloride is useful – and the last to say that everyone who uses it can use 200 tons of it a year. If you do use that much, though, you might profit by buying in bulk rather than bags.

All you need is a conveyor to unload from the hopper car to your spreader trucks. If you prefer to apply calcium chloride in liquid form, you can unload into a tank or directly into a tank-truck partially filled with water.

The chloride itself costs about 20% less in bulk than in bags, and ships for 1.5% less – but the biggest saving of all is in handling costs. Handling bulk calcium chloride out of the hopper car into trucks costs no more than unloading stone or sand. It can be stored outdoors in bulk too, covered with a tarp or a one-foot layer of sand.

When applying liquid chloride, you may want to contract for the unloading, hauling, and applying. The total tab is usually about the same as your own cost when you purchase the chloride in bags.

See the possibilities? They're well worth investigating, if you use enough chloride. And, incidentally, liquid chloride has two big advantages for dust control: It's easier to spread, and it starts to work faster. If you'd like details, write: *Wyandotte Chemicals Corporation, Dept. FS, Wyandotte, Michigan.*

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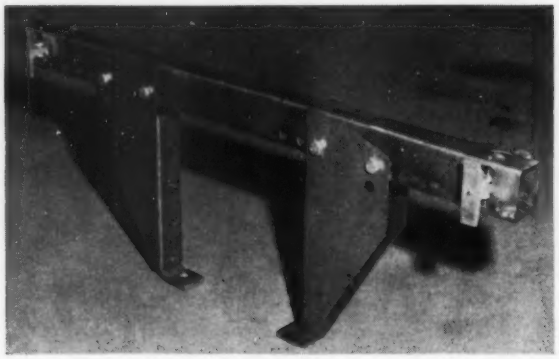
MICHIGAN ALKALI DIVISION
HEADQUARTERS FOR CALCIUM CHLORIDE

products



footing bracket

An all-metal footing bracket is said to give fast and accurate setting. The bracket allows for depth adjustments of from 4″ to 12″, and adjusts to all widths from 4″ to 36″. Vertical adjustment is made possible with a single spring lock adjustment on each end of strut. Steel stakes fit into a locking device to assure inline footings. Both sides of the assembly remain fixed to the bracket for both stripping and setting. Engineered Concrete Form Corp., 7658 S. Wentworth Ave., Chicago 20, Ill.

scaffold plank and bracket

Designed so that it can be stacked one on top of the other without wedging together, this aluminum scaffold plank has the further advantage of saving in weight handling. The scaffold bracket can be advantageously used to take the place of wooden knee bracing on bridge overhang forming. This system is applicable to upstream and downstream faces of dams, wingwalls and abutments of bridges. Williams Form Engineering Corp., 1501 Madison Ave., Grand Rapids, Michigan.

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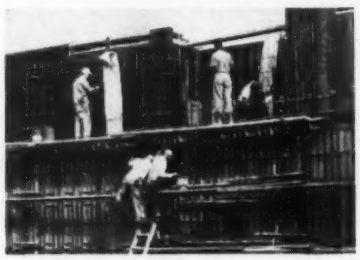

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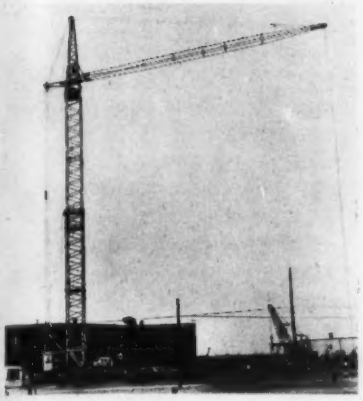

building crane

A new family of giants with a reach of 33 stories high will be imported to this country from Liebherr Ltd. of Killarney, Ireland. Probably their chief advantage over conventional American carrier-mounted erecting cranes is the difference in operating room required. Harnischfeger Corp., Milwaukee 46, Wis.

concrete spreaders

Rex concrete spreader model MW offers a screw type spreader. Its design is said to provide positive spreading action and traction through instant screw control and its 4-wheel drive. It is available in various widths and the spreader frame is infinitely adjustable between minimum and maximum widths. A 79-hp gasoline engine supplies more than adequate hydraulic power for smooth, positive handling of all functions—lifting and lowering the spreader screw and steel strike-off simultaneously, and for controlling the steering brake and screw reversal.

Model PW was designed to cut the high cost of taper-lane, interchange and general street paving by combining the functions of spreading and finishing in one machine. Width changes can be made with the unit on the move. Power widening eliminates costly, time-wasting manual changes, and the third line of forms. Hand finishing is reduced to the minimum. The 16-inch, full-width spreading screw combines a spreading-compacting action and is instantly reversible for spreading to either side. The 16-inch wide, oscillating finishing screed is at the rear of the machine, out in the open and accessible, and has a 4-speed range. Strike-off is fully adjustable for crown changes.

For complete details on model MW ask the manufacturer for bulletin No. 10150 and specification sheet No. 60S; on model PW send for bulletin No. 60-152 and specification sheet 60-PFS. Chain Belt Co., Sales Promotion Dept., Milwaukee, Wisc.

power tamper

A new heavy-duty power tamper is said to produce more compacting force than a 10-ton roller. Powered by a 5.4 gasoline engine, this tamper will tamp between 10,000 and 11,000 square feet of earth backfill in an hour, and is especially adaptable for work next to foundations and walls, around culverts, piling and piers, in pipeline trenches, and on subbases for road widening jobs. Kelley Machine Div., 285 Chicago St., Buffalo 4, N. Y.

polyethylene film

Packaged in rolls in varied lengths and gauges in several widths from 36 inches up to 16 inches, this plastic film is recommended as a permanent water, moisture and vapor barrier under slabs, around foundations and in crawl spaces and as a permanent draft, dust, vapor and moisture barrier and thermal insulator in sidewalls. Its temporary uses include covering for materials and equipment, closing in of structures to protect workmen during cold weather and curing of concrete. Film Div., Olin Mathieson Chemical Corp., 655 Madison Ave., New York, N. Y.

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- **Easy to apply by brushing, dipping or spraying.**

Thompson's Water Seal is deep penetrating, colorless, leaves no residue, won't stain concrete; surface is dust-free, ready for painting.

Available in 5 and 55 gallon drums from suppliers to the construction industry.

See catalog in Sweets Architectural file and Light Construction file.

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